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Volume V
Part 27

INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 27 - Distributed Request Supervisor Product Specification

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This document establishes the design of Function DRS, Distributed Request Supervisor" one of the major functions of the Configuration Item, to be built and formally accepted by the ICAM program office.

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FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

SUBCONTRACTOR	ROLE
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface,and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

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SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of Function DRS, "Distributed Request Supervisor", one of the major functions of the Configuration Item, to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

1.2 Functional Summary

The overall objectives of this CPCI are to:

1. Determine the appropriate sequence of inter database Join, Union and Outer Join operations required to produce the result for a multi-database transaction.

2. Coordinate and control the interactions among a user's application process (AP), the generated Request Processor (RP) and the Aggregator(s) for both single and multi-database transactions.

SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.

2. D. Appleton Co, CDM Administrators Manual: UM620141000, March 1984.

3. D. Appleton Co., CDM1-IDEF1 Model of the Common Data Model; CCS620141000, 15 May 1985.

4. D. Appleton Co., Computer Program Development Specification (DS) for Integrated Support System (IISS) Configuration Item: NDML Precompiler; DS620141200, October 1984.

5. D. Appleton Co., Embedded NDML Programmer's Reference Manual: PRM620141200, March 1985.

6. Softech, Inc., NTM Programmer's Guide: UM620140001, July 1984

7. Control Data Corporation, Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc., of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer reference data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routimes available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System;: (IISS) A test computing environment used to investigate, demonstrate, and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Netwrok.

Mapping: The correspondence of independent objects in two schemas: ES to Cs or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication, and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp., Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing sections source code of the input application program.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3

REQUIREMENTS

3.1 Structural Description

A graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationship of each module making up this CPCI.

The DRS has been coded as a COBOL subprogram with supporting subprograms.

It is internally composed of three subfunctions and defined in the DS Reference 8. These subfunctions are:

1. Initiate/Resume Subtransaction Processing

2. Schedule Stages

3. Initiate CS/ES Transform Processing

3.2 Functional Flow

This CPCI implements the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are to be found in Section 3.10.

This CPCI has been designated to operate in an interactive mode. It must operate in the system environment established for IISS; that is, use of the Network Transaction Manager.

The following exceptions to the Development Specification are noted.

1. The DS calls for the CS/ES transform step to be controlled by the DRS as a separate process, using file input-output and NTM interprocess communication. In interests of efficiency, the CS/ES transform is controlled by code generated into the user AP directly. This saves one file of external query results and allows the interaction with the CS/ES transform to be direct, without use of NTM services.

2. The DS called for the DRS to be a separate process. In the interests of efficiency, it has been implemented as a subprogram called from the user's AP.

3. The contents of Transmission Cost Table are compiled into the DRS. The DRS specifies that this be found in a file.

3.3 Interfaces

The following diagram depicts the interface of DRb and the other CPCI's.

```
                     +-------+
                     |  USER |
                     |   AP  +-------------+
                     +---+---+             |
                         |SUBROUTINE       |
                         |   CALLS         |
                     +---+---+        +----+--------+
                     |  DRS  |        |   CS ES     |
                     |       |        | TRANSFORMERS|
                     +-+-+---+        +-------------+
         +-------------+-+-----------+ NTM SERVICES
  +------+-----+         |    +------+------+
  |  REQUEST   |         |    | AGGREGATORS |
  | PROCESSORS |         |    | PS620141320 |
  +------------+         |    +-------------+
                   +-----+-----------+
                   | FILE UTILITIES  |
                   |  PS620141330    |
                   +-----------------+
```

3.3.1 Input/Outputs

The following table depicts the inputs and outputs of this CPCI. A detailed description for each item can be found in the DS for this CPCI.

FUNCTION: DRS

INPUT	OUTPUT
Subtransaction Number	
DRS Action	Conceptual Schema
	Result File
Pool of Input Tables from	Results Count
the Users Application Process	Module Status
CS Active List	
Join Query Graph	
Attribute Pair List	
Results Field Table	

3.4 Program Interrupts

The DRS makes use of NTM services to start and control multiple request processors at the same time. It also controls multiple instances of aggregators at the same time. It must wait until each process has completed before it can begin its next sequence of activities.

3.5 Timing and Sequencing Description

The DRS can control many request processors at the same time, asynchronously. In other words, it will start all subtransactions of a query and wait for them all to complete. When complete, it handles aggregation of these results. The aggregation may also execute asynchronously in parallel. The DRS will wait for all processes to complete. It has no time limits.

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

No databases are used by this CPCI.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It may use temporary scratch files for such things as generated program source code or temporary query results. The cost information table has not been implemented as a file.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.7.1.3 Item Description

Not applicable to this CPCI.

3.8 Object Code Creation

The object code for this CPCI will be created by the system integration test team by using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL language compiler.

3.9 Adaptation Data

This CPCI has been coded using ANSI COBOL. The intent was to provide a transportable system. Any system environment supporting this language, a virtual memory management scheme, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been made to localize and identify any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Where Include File Used List

The following lists each include file in the documentation group and all the modules documented in this specification which include them. The purpose of each module is listed as well.

```
  DOCGROUP PS41310 Where-include-file-used List

Include          Module
File             Name
-------          ------
ERRCDM
                CDFUNC
                CDLSC
                CDS01
                TOTOPN
                TRMDML
CHKCDM
                CDFUNC
                TOTOPN
                TRMDML
ERRPRO
                CDFUNC
                CDLSC
                CDS01
                TOTOPN
                TRMDML
TCTABLE
                CDS01
CITABLE
                CDS01
RITABLE
                CDS01
QITABLE
                CDS01
SUBPROC
                CDS01
RFTABLE
                CDS01
STDRESP
                CDS01
SRVRET
```

DOCGROUP PS41310 Where-include-file-used List

```
Include          Module
File             Name
-------          ------

                 CDS01
FSMSG
                 CDS01
AGGMSG
                 CDS01
CSAL
                 CDS01
JQGTBL
                 CDS01
APL
                 CDS01
LNKEDGE
                 CDS01
DUMPCIT
                 CDS01
DUMPRIT
                 CDS01
DUMPAPL
                 CDS01
DUMPRFT
                 CDS01
DUMPJQG
                 CDS01
DMPCSAL
                 CDS01
STDTYP
                 CDGTUSR
FPD
                 CDGTUSR
FPCODE
                 CDGTUSR
```

DOCGROUP PS41310 Where-include-file-used List

Include File	Module Name
NDDL	CDGTUSR
OK	CDGTUSR

3.10.2 <u>Where External Routine Used List</u>

The following lists each external function or routine in the documentation group and all the documented modules which call it. The purpose of each module is listed as well.

DOCGROUP PS41310 Where-external-routine-used List

System Module	Module Name
ERRPRO	CDFUNC
	CDLSC
	CDS01
	TOTOPN
	TRMDML
RPMAIN	CDLSC
SIGERR	CDS01
WHTHST	CDS01
GETUSR	CDS01
CHKMSG	CDS01
RCV	CDS01
ASCTIM	CDS01
NSEND	CDS01
ISEND	CDS01
CDJS1	CDS01
CDUS1	CDS01
CDOJS1	CDS01
DELFIL	

```
  DOCGROUP PS41310 Where-external-routine-used List

System          Module
Module          Name
------          ------

                CDS01
SIGABT
                CDS01
OPENX
                TOTOPN
TRMNAT
                TRMDML
STRNCPY
                CDGTUSR
                STRFILL
STRLEN
                CDGTUSR
MEMCPY
                CDGTUSR
STRNCMP
                CDGTUSR
```

3.10.3 Main Program Parts List

The following lists each Main Program in the documentation group and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more that once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external "routine". The Purpose of the Main Program module is listed as well.

DOCGROUP PS41310 Main Program Parts List

Main Pgm Name	Module Name	Module Type
CDFUNC		
	ERRPRO	External routine
CDGTUSR		
	STRNCPY	External routine
	STRLEN	External routine
	MEMCPY	External routine
	STRNCMP	External routine
CDLSC		
	ERRPRO	External routine
	RPMAIN	External routine
CDS01		
	ERRPRO	External routine
	SIGERR	External routine
	CDGTUSR	External routine
	WHTHST	External routine
	GETUSR	External routine
	CHKMSG	External routine
	RCV	External routine
	ASCTIM	External routine
	CDLSC	External routine
	NSEND	External routine
	ISEND	External routine
	CDFUNC	External routine
	CDJS1	External routine
	CDUS1	External routine
	CDOJS1	External routine
	DELFIL	External routine
	SIGABT	External routine
INTFTN		
STRFILL		
	STRNCPY	External routine

DOCGROUP PS41310 Main Program Parts List

Main Pgm Name	Module Name	Module Type
TOTOPN		
	ERRPRO	External routine
	OPENX	External routine
TRMDML		
	ERRPRO	External routine
	CDS01	External routine
	TRMNAT	External routine

3.10.4 Module Documentation

The following documentation describes information which is specific to each individual module in the documentation group being documented in this specification. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME: Name of program Module.

PURPOSE: Purpose of Module as detailed in the source code.

LANGUAGE: Programming language source code is written in.
The choices are:
VAX-11 FORTRAN
C (I/S-1 Workbench 'C')
VAX-11 COBOL

MODULE TYPE: Whether a Program, Subroutine, or Function.

SOURCE FILE: Name of Source File from file specification.

SOURCE FILE TYPE: Source File Extension from file specification.

HOST: Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.

SUBSYSTEM: IISS sub-system this file resides in.

SUBDIRECTORY: Sub-directory of that subsystem in which this file resides.

DOCUMENTATION GROUP: Name of documentation group of which this source file is a member.

DESCRIPTION: A description of the module as otained from the source code.

ARGUMENTS: The arguments with which this routine is called if it is a Subroutine or a Function.

INCLUDE FILES: A list of all the files that are included into this module as well as their purposes.

ROUTINES CALLED: Subroutines or Functions, either documented or external, called by this module, if any.

CALLED DIRECTLY BY: The documented routines which call this module, if any.

USED IN MAIN PROGRAM(S): The documented Main Programs which contain this module in their parts list according to the list in section 3.10.3.

The Module Documentation is arranged alphabetically according to Module Name.

DOCGROUP PS41310 Module Documentation

```
NAME: CDFUNC
PURPOSE: DETERMINE AP NAME GIVEN THE FUNCTION AND HOST
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDFUNC
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:
------------
- PERFORM A TABLE LOOK UP BASED ON THE GIVEN
HOST NAME AND THE FUNCTION DESIRED.
RETURN THE PROPER AP NAME.

-
```

```
ARGUMENTS:
----------
FUNCT-IN                       DSPLY[X(10)]
HOST-IN                        DSPLY[XXX]
TARGET-AP                      DSPLY[X(10)]
RET-STATUS                     DSPLY[X(5)]

INCLUDE FILES:
--------------
ERRCDM
CHKCDM
ERRPRO

ROUTINES CALLED:
----------------
ERRPRO


  DOCGROUP PS41310 Module Documentation

NAME: CDLSC
PURPOSE: Dynamically call the rp-main and return to drs
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDLSC
SOURCE FILE TYPE: COB
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:
------------
-  This routine is called from the drs (cds01)
to do the cobol dynamic call to the rp-main. There
is an ibmversion of this routine that is simply a
stub, since the ibm cannot handle standard cobol
that does dynamic calls.

10/2/89 - CHANGED TO ALWAYS CALL RPMAIN.C NO MATTER WHAT
THE LANGUAGE.  THIS IS SO WE WILL NOT LONGER HAVE
ANY DYNAMIC CALLS.
-
```

ARGUMENTS:

QP-MOD-NAME	DSPLY[X(5)]
LOG-CHAN	DSPLY[999]
RP-MSG-LTH	DSPLY[9(5)]
RP-MSG	RECRD
STD-RESPONSE	RECRD
RPMAIN-LANG	DSPLY[X]
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

ERRCDM
ERRPRO

ROUTINES CALLED:

RPMAIN
ERRPRO

DOCGROUP PS41310 Module Documentation

NAME: CDS01
PURPOSE: THE DISTRIBUTED REQUEST SUPERVISOR
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDS01
SOURCE FILE TYPE: COB
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

- THE DRS IS THE RUN TIME MONITOR OF ALL RUN TIME PROGRAMS NECESSARY TO FULFILL A NDML REQUEST.

MOD REL 2.3:
ADD SUPPORT FOR "IN-LINE CODE" WHICH MEANS ONE OF THE REQUEST PROCESSORS MAY BE LINKED IN LOCALLY AND ACCESSED BY A COBOL "DYNAMIC" CALL. ALSO EACH AGGREGATOR WILL HAVE AN ADDITIONAL CALL-LEVEL INTERFACE. ADD SUPPORT FOR USE OF THE OUTER-JOIN AGGREGATOR INSTEAD OF THE NOT IN SET AGGREGATOR.
MOD 4/30/88 - R. E. STEWART - ADDED CODE TO HANDLE SQLFORMS

ARGUMENTS:

SS-NO-SUBTRANS	DSPLY[999]
DRS-ACTION	DSPLY[X]
SS-POOL	RECRD
CS-ACTION-LIST	RECRD
JQG	RECRD
JQG-ATTRIBUTE-PAIR-LIST	RECRD
USER-RFT	RECRD
CS-RESULTS-FILE	DSPLY[X(80)]
CS-RESULTS-COUNT	DSPLY[9(6)]
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

TCTABLE
CITABLE
RITABLE
QITABLE
SUBPROC
RFTABLE
STDRESP
ERRCDM
SRVRET
FSMSG
AGGMSG
CSAL
JQGTBL
APL
ERRPRO
LNKEDGE
DUMPCIT
DUMPRIT
DUMPAPL
DUMPRFT
DUMPJQG
DMPCSAL

ROUTINES CALLED:

ERRPRO
SIGERR
CDGTUSR
WHTHST
GETUSR
CHKMSG
RCV
ASCTIM
CDLSC
NSEND
ISEND
CDFUNC
CDJS1
CDUS1
CDOJS1
DELFIL
SIGABT

DOCGROUP PS41310 Module Documentation

NAME: TOTOPN
PURPOSE: CONTROL OPENING OF TOTAL DB FILES
LANGUAGE: VAX-11 COBOL
SOURCE FILE: TOTOPN
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: NDDL

DESCRIPTION:

- BY USING A GLOBAL REALM CONTAINING ALL FILES CURRENTLY OPENED BY TOTAL OF THIS PROCESS AND A LOCAL REALM OF FILES A PARTICULAR RP NEEDS, ONLY THE NEW FILES NEED BE OPENED AND RECORDED IN THE GLOBAL REALM TABLE. A SINGLE "OPENX" CALL MAY BE ISSUED, AND EACH FILE SUCCESSFULLY OPENED STORED IN THE GLOBAL REALM. IF ANY FILE IS FOUND IN ERROR, A MESSAGE IS LOGGED.

ARGUMENTS:

LOCAL-REALM	RECRD
GLOBAL-REALM	RECRD
TOTAL-STATUS	DSPLY[X(4)]

INCLUDE FILES:

ERRCDM
CHKCDM
ERRPRO

ROUTINES CALLED:

OPENX
ERRPRO

DOCGROUP PS41310 Module Documentation

NAME: TRMDML
PURPOSE: TERMINATE USE OF NDML AND NTM
LANGUAGE: VAX-11 COBOL
SOURCE FILE: TRMDML
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

- THIS MODULE WILL BE USED TO SIGNAL END OF ANY NDML COMMAND PROCESSING. IT WILL SEND A SPECIAL CALL TO THE DRS, SO THAT IT CAN NOTIFY EACH ACTIVE RP TO DO A CLOSE AND TERMINATE ITS PROCESSING. WHEN THE DRS RETURNS AFTER EACH RP IS DONE, NTM SERVICE TRMNAT WILL BE CALLED TO STOP THE RUN. NOTE, THE USER WILL NOT NEED TO USE TRMNAT.

ARGUMENTS:

TERMINATION-STATUS DSPLY[X]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRPRO

ROUTINES CALLED:

CDS01
TRMNAT
ERRPRO

DOCGROUP PS41310 Module Documentation

NAME: INTFTN
PURPOSE: CONVERT INTEGER VALUE TO CHARACTER STRING **
LANGUAGE: VAX-11 FORTRAN
SOURCE FILE: INTFTN
SOURCE FILE TYPE: FOR
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

```
ARGUMENTS:
----------
NUMBER                          I*4
CHAROT                          CHAR
```

```
  DOCGROUP PS41310 Module Documentation

NAME: CDGTUSR
PURPOSE: GET USER INFORMATION
LANGUAGE: C
SOURCE FILE: CDGTUSR
SOURCE FILE TYPE: C
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:
------------
   THIS IS A VERSION OF THE UI ROUTINE GTUINF, MODIFIED TO
   TO USE THE GLOBAL USER NAME AND ROLE NAME STORED BY
   THE BATCH VERSION OF NDDL.  IT IS CALLED BY THE DRS
   INSTEAD OF THE NTM GETUSR SERVICE WHICH DOESN'T WORK
   WHEN THERE ARE MULTIPLE USERS ON THE NTM AT THE SAME
   TIME.  IF THE DRS IS USED BY SOME OTHER ROUTINE THAN
   NDDL, THIS MAY NOT WORK SINCE THE GLOBAL USER AND ROL
   NAME WONT BE SET UP,  IF IT DOESNT BLOW-UP, THAT'S OK
    SINCE THE DRS IS USING THIS AS A WORKAROUND TO A
   CDM PATCH TO ALLOW MULTIPLE CDM'S ON THE SAME IISS INSTANCE.
   CHECK FOR SPECIAL SQLFORMS FLAG AND SET RCODE TO 77777 IF
FOUND

SYNOPSIS
   FORTRAN VOID CDGTUSR(USRNAM, USROLE, RCODE)
      CHAR USRNAM[];
      CHAR USROLE[];
      CHAR RCODE[];
   INPUTS/OUTPUTS:
   INPUTS:
     NONE
   OUTPUTS:
     USRNAM  - USER'S NAME
     USROLE  - USER'S ROLE
     RCODE   - RETURN CODE
DESCRIPTION
  THIS MODULE WILL RETURN USER NAME AND USER ROLE TO CALLER
```

ARGUMENTS:

USRNAM	CHAR []
USROLE	CHAR []
RCODE	CHAR []

INCLUDE FILES:

STDTYP
FPD
FPCODE
NDDL
OK

ROUTINES CALLED:

STRNCPY
STRLEN
MEMCPY
STRNCMP

DOCGROUP PS41310 Module Documentation

NAME: STRFILL
PURPOSE:
LANGUAGE: C
SOURCE FILE: STRFILL
SOURCE FILE TYPE: C
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

ARGUMENTS:

S	CHAR []
T	CHAR *
N	INT

ROUTINES CALLED:

STRNCPY

3.10.5 Include File Descriptions

The following list contains a purpose and description of each include file in the documentation group as specified in the source code. The language it is written in is also given.

```
  DOCGROUP PS41310 Include File Description

FILE NAME: AGGMSG
PURPOSE:   AGGREGATOR INPUT MESSAGE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
  CONTAINS THE FORMAT OF THE INPUT MESSAGE FOR THE
  CDMP AGGREGATORS


  DESCRIPTION :-

                AGGREGATOR INPUT MESSAGE FORMAT

             NIS = NOT IN SET




  DOCGROUP PS41310 Include File Description

FILE NAME: APL
PURPOSE:   JOIN QUERY ATTRIBUTE PAIR LIST
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
-----------
   CONTAINS INFORMATION ABOUT THE JOIN
           ATTRIBUTES FOR NDML SUBTRANSACTIONS




  DOCGROUP PS41310 Include File Description

FILE NAME: CHKCDM
PURPOSE:   IISS CDMP CHECK STATUS CODES
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
     CONTAINS ALL STATUS CODES FOR THE          *
     CDMP MODULES                               *
```

DOCGROUP PS41310 Include File Description

FILE NAME: CITABLE
PURPOSE: COST INFORMATION TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS TABLE IS USED BY THE DRS TO
TRACK COSTS OF POSSIBLE SUBTRANSACTIONS

DOCGROUP PS41310 Include File Description

FILE NAME: CS
PURPOSE: DISPLAY CONTENTS OF THE COST INFORMATION TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

DOCGROUP PS41310 Include File Description

FILE NAME: CSAL
PURPOSE: CONCEPTUAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

TABLE TO HOLD CONCEPTUAL DATA ABOUT THE REQUEST

NOTE!!!!!! This table is cloned in both cdpre5 and cdpre4 so any changes made to this structure needs to be made in these cloned versions. Clone version is CSALX for CDPRE4.

NOTE AGAIN Any changes to the CS-ACTION-ENTRY must be reflected in CDP10B in the C code generation section. The length of CS-STRING2 has been hard coded in the generated C code in paragraph 210-GEN-MOVE-OF-TABLES.

***** THE CONCEPTUAL SCHEMA ACTION LIST

```
  DOCGROUP PS41310 Include File Description

FILE NAME: DMPCSAL
PURPOSE:   DISPLAYS THE CONTENTS OF THE CS ACTION LIST
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

```
  DOCGROUP PS41310 Include File Description

FILE NAME: DUMPAPL
PURPOSE:   DISPLAYS THE CONTENTS OF THE ATTRIBUTE PAIR LIST
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

```
  DOCGROUP PS41310 Include File Description

FILE NAME: DUMPJQG
PURPOSE:   DISPLAY THE CONTENTS OF THE JQG TABLE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

```
  DOCGROUP PS41310 Include File Description

FILE NAME: DUMPRFT
PURPOSE:   DISPLAY THE CONTENST OF THE RFT TABLE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: DUMPRIT
PURPOSE:   DISPLAY THE CONTENTS OF THE RIT TABLE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: ERRCDM
PURPOSE:   IISS ERROR STATUS CODES FOR CDMP MODULES
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
   CONTAINS ALL ERROR CODES USED BY CDMP       *
   MODULES FOR ERROR HANDLING                  *
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: ERRPRO
PURPOSE:   PROCESS ERROR INCLUDE FILE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: FPCODE
PURPOSE:   FORM PROCESSOR RETURN CODES
LANGUAGE:  C

DESCRIPTION:
------------
```

```
  DOCGROUP PS41310 Include File Description

FILE NAME: FPD
PURPOSE:   FORM PROCESSOR DATA
LANGUAGE:  C

DESCRIPTION:
------------

  DESCRIPTION
     DATA DEFINITIONS FOR ALL FORM PROCESSOR (INCLUDING
MONITER)DATA.


  DOCGROUP PS41310 Include File Description

FILE NAME: JQGTBL
PURPOSE:   JOIN QUERY GRAPH TELLS HOW TO CONNECT
SUBTRANSACTIONS
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------


  DOCGROUP PS41310 Include File Description

FILE NAME: LNKEDGE
PURPOSE:   DETERMINE DUPLICATE EDGES IN THE JQG
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
     DURING JQG COLLAPSING, DUPLICATE JQG ENTRIES MAY RESULT
WITH
     DIFFERENT APL'S.  THIS WILL BE EXECUTED AT THE END OF
SENDS
     FOR A STAGE AND WILL FIND THE DUPLICATE EDGES AND HOOK THE
     APL'S TOGETHER BEFORE THE CIT IS REBUILT AT THE BEGINNING
     OF THE NEXT STAGE.


  DOCGROUP PS41310 Include File Description

FILE NAME: NDDL
PURPOSE:
LANGUAGE:  C

DESCRIPTION:
------------
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: OK
PURPOSE:   GOOD RETURN CODE VALUE FOR UI
LANGUAGE:  C

DESCRIPTION:
------------
  DESCRIPTION

  CONTAINS THE VALUE FOR A GOOD RETURN CODE
  FROM THE USER INTERFACE
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: QITABLE
PURPOSE:   REQUEST PROCESSOR INFORMATION TABLE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
-----------
        THIS TABLE WILL TRACK ALL ACTIVE REQUEST PROCESSORS
         FOR THE DRS.

                                 QITABLE.INC
```

DOCGROUP PS41310 Include File Description

```
FILE NAME: RFTABLE
PURPOSE:   THE RESULT FIELD TABLE
LANGUAGE:  VAX-11 COBOL

DESCRIPTION:
------------
         CONTAINS CONCEPTUAL SCHEMA INFORMATION ABOUT
         THE RESULTS OF AN NDML REQUEST


        THE RESULT FIELD TABLE

          WHEN CHANGING THE STRUCTURE OF THIS TABLE
          BE SURE TO CHANGE THE LAYOUT IN THE
          LINKAGE SECTION OF THE DRS (CDS01)
          WHICH WAS COPIED FROM THIS.
```

DOCGROUP PS41310 Include File Description

FILE NAME: RITABLE
PURPOSE: RIT- RELATION INFORMATION TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

USED BY THE DRS TO KNOW ABOUT EACH RELATION IN A TRANSACTION

THIS TABLE MUST HAVE THE SAME NUMBER OF OCCURS AS THE SUBPROC.INC SINCE THEY ARE PARALLEL TABLES.

DOCGROUP PS41310 Include File Description

FILE NAME: SRVRET
PURPOSE: MESSAGE FOR THE FILE SEND UTILITY
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

MESSAGE FORMAT FOR THE FILE SEND INPUT

DOCGROUP PS41310 Include File Description

FILE NAME: STDRESP
PURPOSE: WS DEFINITION FOR STANDARD STATUS VARIABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THE STANDARD 'PROCESS COMPLETE' MESSAGE

DOCGROUP PS41310 Include File Description

FILE NAME: STDTYP
PURPOSE: STANDARD TYPE DEFINITIONS
LANGUAGE: C

DESCRIPTION:

```
  DESCRIPTION
     THIS FILE ENSURES THAT THE FOLLOWING STANDARD TYPES ARE
AVAILABLE:
        FLOAT    - SINGLE PRECISION FLOAT
        DOUBLE   - DOUBLE PRECISION FLOAT

        LONG     - 32 BIT (OR LARGER) SIGNED INTEGER
        LBITS    - 32 BITS (OR MORE) FOR BIT MANIPULATION

        INT      - NATURAL SIZE SIGNED INTEGER
        UNSIGNED - NATURAL SIZE UNSIGNED INTEGER
        BOOL     - NATURAL SIZE LOGICAL (ZERO / NON-ZERO ONLY)

        SHORT    - 16 BIT (OR LARGER) SIGNED INTEGER
        USHORT   - 16 BIT (OR LARGER) UNSIGNED INTEGER
        BITS     - 16 BITS (OR MORE) FOR BIT MANIPULATION

        CHAR     - SINGLE MACHINE CHARACTER (REAL CHARACTERS
                        ALWAYS POSITIVE)
        TINY     - 8 BIT (OR LARGER) SIGNED INTEGER
        UTINY    - 8 BIT (OR LARGER) UNSIGNED INTEGER
        TBITS    - 8 BITS (OR MORE) FOR BIT MANIPULATION
        TBOOL    - 8 BIT (OR LARGER) LOGICAL (ZERO / NON-ZERO
                        ONLY)

        METACHAR - 16 BIT (OR LARGER) AUGMENTED CHARACTER
                        (SIGNED)

        VOID     - FUNCTION THAT RETURNS NO VALUE

        FORTRAN  - STORAGE CLASS FOR FOREIGN (NON-C) ROUTINES
                        OR C ROUTINES
                   WHICH ARE CALLABLE FROM FOREIGN ROUTINES

     SINCE NOT ALL COMPILERS SUPPORT USHORT, TINY, AND UTINY,
THE FUNCTIONS
     USHORT(), TINY(), AND UTINY() SHOULD BE USED WHENEVER
REFERENCING THEM.
```

```
     IN ADDITION, THE FOLLOWING UTILITY MACROS ARE DEFINED:
        LURSHIFT(N, B) - UNSIGNED LONG RIGHT SHIFT
        MAX(A, B)      - MAXIMUM OF A AND B
        MIN(A, B)      - MINIMUM OF A AND B
        ABS(A)         - ABSOLUTE VALUE OF A
        STRASN(A, B)   - TRANSPORTABLE A = B FOR STRUCTURES
        NULL           - NULL POINTER VALUE (0)
        TRUE           - 1
        FALSE          - 0
        SUCCESS        - EXIT(SUCCESS) INDICATES SUCCESSFUL
                                COMPLETION
        FAILURE        - EXIT(FAILURE) INDICATES ERRORS

     THE FOLLOWING SYMBOLS SHOULD BE DEFINED BASED ON THE
COMPILER BEING USED:
        USHORT  - COMPILER SUPPORTS UNSIGNED SHORT
        TINY    - COMPILER TREATS CHAR AS SIGNED
        UTINY   - CHAR IS SIGNED AND COMPILER SUPPORTS
UNSIGNED CHAR
        VOID    - COMPILER SUPPORTS VOID
        FORTRAN - COMPILER SUPPORTS FORTRAN
        STRASN  - DEFINE APPROPRIATE MACRO
        SUCCESS - DEFINE APPROPRIATE VALUE IF NOT 0
        FAILURE - DEFINE APPROPRIATE VALUE IF NOT 1
```

DOCGROUP PS41310 Include File Description

FILE NAME: SUBPROC
PURPOSE: SUBTRANSACTION PROCESSES ID TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS TABLE MUST HAVE THE SAME NUMBER OF OCCURS AS THE RITABLE.INC AND QITABLE.INC SINCE THEY ARE PARALLEL TABLES.

DOCGROUP PS41310 Include File Description

FILE NAME: TCTABLE
PURPOSE: TRANSMISSION COST TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

HOLDS RELATIVE COST OF TRANSMISSION/PROCESSING FILE TRANSFERS/JOINS ON THE NETWORK AND IS USED AS A BASIS OF STAGER/SCHEDULER OPTIMIZATION ALGORITHMS

THESE ARE THE EXPERIMENTAL VALUES FOR THE TCT:

3.10.6 Hierarchy Chart

```
                                                          1
  +-------+  +------+  +-------+  +-------+  +--------+
  |CDFUNC|  |CDLSC|  |TOTOPN|  |TRMDML|  |STRFILL|
  +---+---+  +-----2+  +---+---+  +------3+  +---+----+
      |                    |                     |
      |             +----+------+               |
      |             |           |               |
 +---+-----+   +---+----+  +---+-----+   +----+-----+
 |ERRPRO   |   |OPENX   |  |ERRPRO   |   |STRNCPY   |
 +---------+   +--------+  +---------+   +----------+
```

```
                                                         2
                 +------+
                 |CDLSC|
                 +--+--+
                    |
             +-----+-----+
             |           |
        +---+----+  +---+----+
        |RPMAIN  |  |ERRPRO  |
        +--------+  +--------+
                                                              3
                                          +-------+
                                          |TRMDML|
                                          +---+---+
                                              |
                                  +-----------+------------+
                                  |           |            |
                              +---+---+   +---+-----+   +---+-----+
                              |CDS01  |   |TRMNAT   |   |ERRPRO   |
                              +---+---+   +---------+   +---------+
                                  |
         +-----------+------------+------------+-----------+
         |           |            |            |           |
     +---+-----+ +---+-----+  +---+-----+  +---+-----+ +---+---+
     |ERRPRO   | |SIGERR   |  |CDGTUSR  |  |WHTHST   | |(CONT)|
     +---------+ +---------+  +----+----+  +---------+ +-----4+
                                   |
               +-----------+-------+------+-------------+
               |           |              |             |
          +----+----+ +----+----+  +---+-----+  +----+-----+
          |STRNCPY  | |STRLEN   |  |MEMCPY   |  |STRNCMP   |
          +---------+ +---------+  +---------+  +----------+


                                                              4
                              +-------+
                              |CDS01  |
                              +---+---+
                                  |
                       +----------++----------+
                       |           |          |
                    +--+---+  +---+-----+  +---+-----+
                    |(CONT)|  |GETUSR   |  |CHKMSG   |
                    +-----3+  +---------+  +---------+
```

```
CDFUNC.......1
CDGTUSR  ....3
CDLSC........2
CDS01   ......3
CHKMSG
ERRPRO
GETUSR
MEMCPY
OPENX
RPMAIN
SIGERR
STRFILL......1
STRLEN
STRNCMP
STRNCPY
TOTOPN.......1
TRMDML.......3
TRMNAT
WHTHST
```

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."

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